

1. Compute and plot $y[n] = x[n] * h[n]$, where

$$x[n] = \begin{cases} 1, & 3 \leq n \leq 8 \\ 0, & \text{otherwise} \end{cases}, h[n] = \begin{cases} 1, & 4 \leq n \leq 15 \\ 0, & \text{otherwise} \end{cases}$$

$$y[n] = \begin{cases} n-6, & 7 \leq n < 11 \\ 6, & 12 \leq n \leq 18 \\ 24-n, & 19 \leq n \leq 23 \\ 0, & \text{otherwise} \end{cases}$$

2. Determine and sketch the convolution of the following two signals:

$$x(t) = \begin{cases} t+1, & 0 \leq t \leq 1 \\ 2-t, & 1 < t \leq 2 \\ 0, & \text{elsewhere} \end{cases}$$

$$y(t) = \begin{cases} t+3, & -2 < t \leq -1 \\ t+4, & -1 < t \leq 0 \\ 2-2t, & 0 < t \leq 1 \\ 0, & \text{elsewhere} \end{cases}$$

and

$$h(t) = \delta(t+2) + 2\delta(t+1)$$

3. Let $h(t) = e^{2t}u(-t+4) + e^{-2t}u(t-5)$

Determine A and B such that

$$A = t-5$$

$$B = t-4$$

$$h(t-\tau) = \begin{cases} e^{-2(t-\tau)}, & \tau < A \\ 0, & A < \tau < B \\ e^{2(t-\tau)}, & B < \tau \end{cases}$$

4. Let $x(t) = u(t-3) - u(t-5)$ and $h(t) = e^{-3t}u(t)$

Compute

(a) $y(t) = x(t) * h(t)$

(b) $g(t) = \frac{dx(t)}{dt} * h(t)$

$$y(t) = \begin{cases} -\frac{1-e^{-3t}}{3}, & 3 < t \leq 5 \\ \frac{(1-e^{-6})e^{-3(t-5)}}{3}, & 5 < t \leq \infty \end{cases}$$

$$g(t) = e^{-3(t-3)} - e^{-3(t-5)} u(t-5)$$